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Description

This invention relates to portable vacuum cleaners and, more particularly, to a vacuum cleaner of the kind disclosed in US-A-4 536 914 and comprising the features defined in the preamble of the present Claim 1 capable of operating both with air and liquid cleaners.

Vacuum cleaners are utilized in numerous situations ranging from relatively light duty, such as the removal of crumbs and dust from a flat surface, as well as for relatively heavy duty operation as in the withdrawal of foreign matter embedded in carpets and upholstery. It is apparent from the wide range of cleaning tasks that some cleaning is best accomplished by the use of air alone, while other cleaning is best accomplished with the use of water or other cleaning liquid which is to be drawn by suction into the vacuum cleaner.

It is recognized that the use of a liquid cleaning agent necessitates a more complex structure in the vacuum cleaner. Thus, it is necessary to protect a fan motor from contamination by the liquid. Provision must also be made for extraction of the foreign matter and the liquid cleaner from the vacuum cleaner upon completion of the cleaning process. In addition, the foregoing must be accomplished while allowing for the intake and exhaust of the air stream which is driven by suction of the cleaner fan.

The foregoing constraints become more difficult to attain in the case of a portable vacuum cleaner, since, as is readily appreciated, a hand held cleaner may be placed in a variety of positions and orientations so that, unlike a stationery cleaner, reliance cannot be made solely on the use of gravity for direction of the liquid cleaning agent away from the motor. Also, it is realized that the use of the traditional vacuum-cleaner bag fabricated of cloth or paper would be contraindicated since any liquid entrapped therein would tend to leak out upon removal of the bag.

Thus, a problem exists in that the desirable feature of portability in a vacuum cleaner is difficult to attain in a situation wherein the vacuum cleaner is to be used for both wet and dry cleaning applications.

The foregoing problem is overcome and other advantages are provided by a vacuum cleaner which employs an electrically driven blower wherein batteries are utilized to power the electric motor so that portable operation can be attained. In accordance with the invention, both the liquid cleaning agent and the dirt are drawn through the nozzle, in response to the vacuum, and are then deposited in a storage chamber. Both the chamber and the nozzle are formed in the unitary structure of a canister which is readily secured to and re-

moved from a housing which contains the motor and the fan. Thereby, the liquid and the dirt can be readily disposed of by detaching the canister from the housing, and then simply pouring out the liquid and the dirt from the canister. The canister is fabricated, preferably, of a hard plastic material which may be washed so that the canister can be reused many times, thereby obviating the need for a cloth or paper bag.

A partial vacuum produced by the fan provides a suction passage through the nozzle into the chamber and then into the housing to the fan. At an interface between the canister and the housing, there is provided a structure for the deflection of the liquid away from an entry port of the housing while permitting the air to pass into the housing.

It is known from EP-A-0170720, which has to be considered according to Article 54 (3) (4) EPC, to provide a vacuum cleaner comprising a motor; a housing having a front end and a back end, said housing enclosing said motor; a blower driven by said motor and disposed ahead of said motor within said housing, rotation of said blower producing a vacuum;

a cannister removably attached to the front end of said housing, said canister having an intake nozzle for reception of dirt, liquid and air drawn into said nozzle in response to a vacuum developed by said blower,

said canister including a storage chamber disposed alongside an exit port of said nozzle for the storage of the dirt and the liquid drawn in via said nozzle; and

deflection means disposed between said blower and said nozzle for deflecting liquid and dirt drawn in via said nozzle away from a stream of air which flows from said nozzle to said blower,

an air conduit disposed ahead of said blower and guiding the air stream from said canister to said blower, said conduit communicating with an inlet chamber having an entry port for receiving air from said canister,

said entry port being offset from the location of said storage chamber so as to inhibit the passage of any of the liquid from said storage chamber into said conduit when said vacuum cleaner is orientated with a horizontal orientation placing said storage chamber beneath said nozzle;

said entry port of said conduit being formed with a snout extending into said canister, said snout preventing the entry of liquid into said inlet chamber when said chamber is oriented with said horizontal orientation or when tipped to place said nozzle above said blower;

the cleaner further comprising a filter disposed along the rear of said inlet chamber, said filter entraining particulate matter carried by said air-stream;

said housing including vents alongside said motor, for exhausting air driven by said blower along with any dirt and liquid which, under suction of the vacuum, may have passed from said canister via said filter to said housing; and

said air conduit having a generally conical shape with a smaller diameter opening towards the rear of said housing, thereby to guide air to a central portion of said blower (14) while providing further space for the catching of any liquid which might have passed through said filter.

The present invention provides a vacuum cleaner comprising a motor (230);

a housing (222) having a front end and a back end, said housing enclosing said motor;

a blower (228) driven by said motor and disposed ahead of said motor within said housing, rotation of said blower producing a vacuum;

a canister (224) removably attached to the front end of said housing, said canister having an intake nozzle (244) for reception of dirt, liquid, and air drawn into said nozzle in response to a vacuum developed by said blower;

said canister including a storage chamber (246) disposed adjacent an exit port (264) of said nozzle for the storage of the dirt and the liquid drawn in via said nozzle; and

deflection means disposed between said blower and said nozzle for deflecting liquid and dirt drawn in via said nozzle away from a stream of air which flows from said nozzle to said blower, an air conduit (250) disposed ahead of said blower and guiding the air stream from said canister to said blower, said conduit communicating with an inlet chamber (266) having an entry port (268) with an opening for receiving air from said canister;

characterized in that said opening is offset from the location of said storage chamber so as to inhibit the passage of any of the liquid from said storage chamber into said conduit when said vacuum cleaner is oriented with a horizontal orientation placing said storage chamber beneath said nozzle; and

said entry port of said conduit being formed with a snout (282) extending into said canister, said snout preventing the entry of liquid into said inlet chamber when said cleaner is oriented with said horizontal orientation or when tipped so as to place said nozzle above said blower; a filter (256) disposed along the rear of said inlet chamber, said filter entraining particulate matter carried by said airstream;

vents (258) alongside said motor for exhausting air driven by said blower along with any dirt and liquid which, under suction of the vacuum, may have passed from said canister via said filter to said housing;

said air conduit having a generally conical

shape with a smaller diameter opening towards the rear of said housing, thereby to guide air to a central portion of said blower while providing further space for the catching of any liquid which might have passed through said filter;

said housing includes vents (258) disposed behind and to the side of an exit port of said air conduit to provide an escape path for any liquid which may have entered said conduit.

The invention will be further apparent from the following description with reference to the figures of the accompanying drawings which show, by way of amendment only, one form of vacuum cleaner embodying same.

Of the drawings:

Fig 1 is a top plan view of the vacuum cleaner.

Fig 2 is a vertical sectional view of the alternative embodiment of the vacuum cleaner of Fig 1;

Figs 3 and 4 are fragmentary sectional views of components of the housing disclosed in Fig 2;

Fig 5 is a front view of the embodiment of Fig 1;

Fig 6 is a front view of the opening to the inlet chamber to the air conduit of Fig 2;

Fig 7 is a horizontal sectional view of the inlet chamber of Fig 6;

Fig 8 is a vertical sectional view of the inlet chamber of Fig 6;

Fig 9 is a rear view of the inlet chamber of Fig 6;

Fig 10 is a front elevation view of an air conduit leading air to the blower of Fig 2;

Fig 11 is a plan view of, partially sectioned, of the air conduit of Fig 10;

Fig 12 is a vertical sectional view of the air conduit of Fig 10;

Fig 13 is a rear view of the air conduit of Fig 10;

Figs 14 and 15 are, respectively, a front view and a side sectional view member for holding the rear of the air conduit of Fig 2;

Figs 16 and 17 are, respectively, a front view and a side sectional view of an air filter of Fig 2; and

Figs 18, 19 and 20 are, respectively, a front view, a side sectional view and a side elevation view of the blower of Fig 2.

Referring now to the drawings it will be seen that the vacuum cleaner 220 comprises a central housing 222 having a canister 224 affixed to a front end thereof and a handle 226 extending from the back end thereof.

The housing 222 contains a blower 228 which may also be referred to as a fan or impeller and an electric motor 230 coupled by a shaft 232 to the blower 228. Rotation of the shaft 232 by the motor 230 imparts rotation to the blower 228 to create a partial vacuum and accompanying suction which

draws air through the canister 224 into the housing 222. The motor 230 is supported within the housing 222 by ribs 234-235 which are disposed circumferentially around the motor 230 and contact the interior surface of the housing, 222. The motor 230 is powered by batteries 236. A switch 238 is positioned on the underside of the handle 226 for convenient engagement by means of the finger of a person utilizing the cleaner 220. Operation of the switch 238 provides for the coupling of electric power from the batteries 236 to the motor 230 for activation of the motor 230. A battery charger 240 may also be positioned within the handle 226 for recharging the batteries 236 during a period of nonuse of the cleaner 220, the charger being connected by a suitable electric cord (not shown) to an electrical convenient power outlet. Electric wiring (not shown) connects the batteries 236 by the switch 238 to the motor 230 and also connects the charger 240 to the batteries 236.

In accordance with a feature of the invention, the canister 224 incorporates a nozzle 244 and a storage chamber 246 disposed beneath the nozzle 244. The chamber 246 is used for the collection of any liquid cleaning agents which may be drawn in by suction into the cleaner 220. The canister 224 is shown as being removably attached by means of a spring-lock configuration 248 molded into the forward end of the canister 224.

Within the housing 222, a conduit 250 having an entry port 252 inducts air under suction from the canister 224 to the blower 228. The entry port 252 is located at the region of an interface between the housing 222 and the canister 224. An air filter 256 is located at the entry port 252 for encrapment of particulate matter which may otherwise be drawn into the conduit 250 by the passage of air toward the blower 228. Air drawn in by the blower 228 passes through the blower 228 and is then exhausted from the housing 222 via exhaust vent 258 disposed in the circumferential surface of the housing 222 and, more particularly, at the bottom portion of the housing 222 to permit the escape of any liquid which may have been drawn by the air stream through the filter 256 and the blower 228. Thus, in response to the suction generated by the blower 228, air enters the nozzle 244 via a passage 260 thereof, and thereafter flows through the passage 260 into the chamber 246.

In accordance with the invention, the nozzle 244 is provided with a diverter 262 disposed at an exit port 264 at the posterior end of the passage 260. The conduit 250 is provided with an inlet chamber 266 bounded by a front wall which forms an air-entry port 268 having an opening which is offset from the central axis of the housing 222. the opening of the port 268 is located near the top of the storage chamber 246 to prevent the flow of

liquid stored in the chamber 246 from flowing into the conduit 250. The diverter 262 diverts incoming liquid down towards the bottom of the chamber 246 and away from the opening of the port 268. Thereby, incoming liquid with dirt entrained therein is deflected away from the flow of the air stream, which air flows from the passage 260 via the chamber 246 into the port 268. The conduit 250 is supported by a partition 270 at the front end thereof, and by a partition 271 at the back end thereof to the housing 222. The air-entry port 268 in cooperation with the deflector 262 constitutes a deflection structure, indicated generally by the numeral 272, to accomplish the foregoing deflection of the liquid into the chamber 246 away from the air conduit 250. The deflection structure 272 separates the liquid from the air, the liquid remaining in the chamber 26 while the air passes under the force of suction into the region of the blower 228.

In operation, air, or both air and liquid may be drawn into the cleaner 220 depending on whether the cleaner 220 is used for dry operation or wet operation. While the cleaner 220 operates well in both situations, the invention is particularly useful in the case of the utilization of liquid cleaning agents, such as water or other solvents, along with the air which carries the liquid and dirt via the nozzle 244 into the chamber 246. By virtue of the deflection structure 272, the deflector 262 directs all matter entering the passage 260 downwards towards the bottom of the storage chamber 246. Liquid and any dirt entrained therein remains at the lower portion of the storage container 246 while the air under suction proceeds through a sinuous path back up to the opening of the inlet chamber 266 for further passage into the air conduit 250. When the cleaner 220 is used for dry operation only, any particulate matter which may be carried in by the air stream is caught within the canister 224. Relatively heavy particles which may have been lifted off a surface being cleaned by the air rushing into the nozzle 244 may drop out of the air stream under conditions of turbulence within the chamber 246 and be deposited on the bottom of the chamber 246. Lighter particles carried in by the air stream advance through the chamber 246 and the entry port 268 to impinge upon the filter 256. Such particles are entrained within the filter 256 while the air advances to the blower 229 for subsequent exit via the vents 258.

When the cleaner 220 is held in a substantially horizontal position, or in a position wherein the canister 224 is pointing in a generally downward direction, the liquid accumulates in the chamber 246 and rises against the lower portion of the front wall of the inlet chamber 266. At this point, the chamber 246 should be regarded as sufficiently full to require emptying of the liquid before further

cleaning is attempted. The canister 224 with the entry port are detached from the housing 222 to permit emptying of the contents thereof. Thereby, the filter 256 is exposed for removal and cleaning. It is also noted that dirt entrained by the filter 256 may fall to the bottom of the inlet chamber 266 so as to collect therein just as the liquid collects in the bottom of the storage chamber 246. Thereby, the canister 224 has accumulated both the liquid from a wet cleaning operation and dust from a dry cleaning operation.

In the event that the cleaner 220 were tipped upwards so that the liquid stored in the chamber 246 would flow towards the rear of the chamber, the forward protrusion of the cone shaped portion of the entry port 268 would prevent the ingress of liquid into the inlet chamber 266. Even in the event that the chamber 246 became overloaded with liquid, in which case some liquid may find its way through the opening of the entry port 268 into the conduit 250, the motor 230 is protected from the liquid by a baffle 274 formed in the base portion of the front rib 235, the baffle 274 extending rearwardly beneath the motor 230 to uncover vents 258 which would allow the excess liquid to be forced out with the exhaust air from the blower 228. In addition, it is noted that the supporting of the conduit 250 by front partition 270 and rear partition 271 maintains the conduit 250 positioned along the axis of the housing 22, the conical shape of the conduit 250 with the attendant sloping bottom wall (as depicted in Fig. 2) providing still further space for the capture of excess liquid for protection of the motor 230.

With respect to further details in the construction of the cleaner 220, the housing 222 is advantageously strengthened by the use of ribs 278 (Fig. 3). The front end of the nozzle 244 is advantageously provided with serrations 280 (Fig. 5) which provide for a scraping or combing function of the nozzle 244 which aids in the cleaning of fabrics. As depicted in Figs. 6 - 9, the offset entry port 268 is formed with a snout 282 integrally formed on the upper portion of the front wall 284 of the inlet chamber 266. A bead 286 is disposed along the rim of the chamber 266 to facilitate assembly and disassembly of the canister 224. A vane 288 guides air in laminar flow through the port 268. The conduit 250 (Figs.10-13) is also provided with a bead 290 along an outer rim of the front partition 270 to aid in assembling and disassembling of the conduit 250 with the housing 222. If desired, a portion of the conic wall of the conduit 250 may be configured with different slopes to aid further in containing the liquid forward of the blower 228.

With reference to Figs. 14-15 the rear partition 271 is configured with a relatively small central aperture 292 for engagement with the downstream

end of the conduit 250. The filter 256 (Figs. 16-17) is provided with a generally flat shape, a uniform thickness, and a generally rounded periphery so as to be readily inserted along the interface 254 between the canister 224 and the housing 222. The blower 228 (Figs. 18-20) comprises a set of spiral vanes 294 mounted on a base plate 296 which provides strength to the blower 228, the overall configuration of the blower 228 having a shape which is readily molded.

In view of the foregoing description of the alternative embodiment of the cleaner, it is readily apparent that the alternative embodiment provides for still further resistance to any leakage of liquid from the canister into the motor compartment of the cleaner. In addition, all of the components are readily fabricated and securely mounted for long life.

It is to be understood that the above described embodiments of the invention are illustrative only and that modifications thereof may occur to those skilled in the art. Accordingly, this invention is not to be regarded as limited to the embodiments disclosed herein, but is to be limited only as defined by the appended claims.

Claims

1. A vacuum cleaner comprising a motor (230);
a housing (222) having a front end and a back end, said housing enclosing said motor;
a blower (228) driven by said motor and disposed ahead of said motor within said housing, rotation of said blower producing a vacuum;
a canister (224) removably attached to the front end of said housing, said canister having an intake nozzle (244) for reception of dirt, liquid, and air drawn into said nozzle in response to a vacuum developed by said blower;
said canister including a storage chamber (246) disposed adjacent an exit port (264) of said nozzle for the storage of the dirt and the liquid drawn in via said nozzle; and
deflection means disposed between said blower and said nozzle for deflecting liquid and dirt drawn in via said nozzle away from a stream of air which flows from said nozzle to said blower, an air conduit (250) disposed ahead of said blower and guiding the air stream from said canister to said blower, said conduit communicating with an inlet chamber (266) having an entry port (268) with an opening for receiving air from said canister;
characterized in that said opening is offset from the location of said storage chamber so as to inhibit the passage of any of the liquid from said storage chamber into said conduit

when said vacuum cleaner is oriented with a horizontal orientation placing said storage chamber beneath said nozzle; and

said entry port of said conduit being formed with a snout (282) extending into said canister, said snout preventing the entry of liquid into said inlet chamber when said cleaner is oriented with said horizontal orientation or when tipped so as to place said nozzle above said blower; a filter (256) disposed along the rear of said inlet chamber, said filter entraining particulate matter carried by said airstream;

vents (258) alongside said motor for exhausting air driven by said blower along with any dirt and liquid which, under suction of the vacuum, may have passed from said canister via said filter to said housing;

said air conduit having a generally conical shape with a smaller diameter opening towards the rear of said housing, thereby to guide air to a central portion of said blower while providing further space for the catching of any liquid which might have passed through said filter;

said housing includes vents (258) disposed behind and to the side of an exit port of said air conduit to provide an escape path for any liquid which may have entered said conduit.

2. A cleaner according to claim 2, wherein said housing includes a transverse rib (235) for supporting a front end of said motor, there being a baffle (274) extending from an end of said rib to a site behind said vents for guiding liquid away from said motor and out through said vents.

Revendications

1. Aspirateur comprenant un moteur (230);

un boîtier (222) comportant une extrémité frontale et une extrémité dorsale, ledit boîtier renfermant ledit moteur;

un ventilateur (228) entraîné par ledit moteur et disposé en avant dudit moteur à l'intérieur dudit boîtier, la rotation dudit ventilateur créant un vide;

un récipient (224) fixé de manière amovible à l'extrémité frontale dudit boîtier, ledit récipient ayant un suceur (244) pour la réception des poussières, des liquides et de l'air aspirés dans ledit suceur par suite du vide créé par ledit ventilateur;

ledit récipient comprenant une chambre de stockage (246) disposée de manière adjacente à l'orifice de sortie (264) dudit suceur pour le stockage des poussières et des liquides aspirés par l'intermédiaire dudit suceur; et

un moyen défecteur disposé entre ledit

ventilateur et ledit suceur pour écarter les liquides et les poussières aspirés par l'intermédiaire dudit suceur d'un courant d'air qui circule dudit suceur jusqu'audit ventilateur, une conduite d'air (250) disposée en avant dudit ventilateur et qui guide le courant d'air dudit récipient jusqu'audit ventilateur, ladite conduite communiquant avec une chambre d'entrée (266) qui comporte un orifice d'entrée (268) avec une ouverture pour recevoir l'air provenant dudit récipient;

caractérisé en ce que ladite ouverture est décalée par rapport à la position de ladite chambre de stockage de manière à empêcher le passage de tout liquide de ladite chambre de stockage dans ladite conduite lorsque ledit aspirateur est orienté suivant une orientation horizontale plaçant ladite chambre de stockage au-dessous dudit suceur; et

ledit orifice d'entrée de ladite conduite est muni d'un bec (282) qui s'étend dans ledit récipient, ledit bec empêchant l'entrée des liquides dans ladite chambre d'entrée lorsque ledit aspirateur est orienté suivant ladite orientation horizontale ou lorsqu'il est incliné de manière à placer ledit suceur au-dessus dudit ventilateur;

un filtre (256) disposé à l'arrière de ladite chambre d'entrée, ledit filtre retenant les matières particulaires entraînées par ledit courant d'air;

des orifices (258) le long dudit moteur pour évacuer l'air entraîné par ledit ventilateur en même temps que les poussières et les liquides qui, sous l'aspiration du vide, peuvent être passés dudit récipient dans ledit boîtier par l'intermédiaire dudit filtre;

ladite conduite d'air ayant une forme généralement conique avec un plus petit diamètre débouchant vers l'arrière dudit boîtier, pour guider l'air vers la partie centrale dudit ventilateur tout en procurant un espace supplémentaire pour capter tout liquide qui peut avoir franchi ledit filtre;

ledit boîtier comprend des orifices (258) disposés derrière et sur le côté d'un orifice de sortie de ladite conduite d'air pour fournir une voie d'évacuation pour tout liquide qui peut avoir pénétré dans ladite conduite.

2. Aspirateur selon la revendication 2, dans lequel ledit boîtier comprend une nervure transversale (235) pour supporter une extrémité frontale dudit moteur, une chicane (274) s'étendant depuis une extrémité de ladite nervure jusqu'à une position située derrière lesdits orifices pour guider les liquides en les écartant dudit moteur et vers l'extérieur par lesdits orifices.

Ansprüche

1. Staubsauger mit einem Motor (230), einem Gehäuse (222) mit einem vorderen und einem hinteren Ende, wobei das Gehäuse den Motor umschließt;
 einem von dem Motor angetriebenem Gebläse (228), das vor dem Motor im Gehäuse liegt, wobei die Drehung des Gehäuses einen Unterdruck erzeugt,
 einen lösbar mit dem vorderen Ende des Gehäuses verbundenen Ansatz (224), der eine Ansaugdüse (244) zur Aufnahme von Schmutz, Flüssigkeit und Luft aufweist, die abhängig von dem vom Gebläse erzeugten Unterdruck in die Ansaugdüse gesaugt werden, wobei der Ansatz eine Speicherkammer (246), die angrenzend an einen Auslaß (246) der Düse zur Speicherung des über die Düse eingesaugten Schmutzes und der Flüssigkeit angeordnet ist, aufweist und
 einer Ablenkvorrichtung, die zwischen dem Gebläse und der Düse angeordnet ist und zur Ablenkung der eingesaugten Flüssigkeit und des Schmutzes weg von dem Luftstrom dient, der von der Düse zu dem Gebläse strömt, wobei ein vor dem Gebläse angeordneter Luftkanal (250) den Luftstrom von dem Ansatz zum Gebläse leitet und mit einer Einlaßkammer (266) in Verbindung steht, die einen Einlaßkanal (268) mit einer Öffnung zur Aufnahme von Luft aus dem Ansatz aufweist,
dadurch gekennzeichnet, daß die Öffnung zur Lage der Speicherkammer versetzt angeordnet ist, um den Durchgang von Flüssigkeit aus der Speicherkammer in den Luftkanal zu verhindern, wenn der Staubsauger horizontal ausgerichtet ist, wobei die Speicherkammer unter der Düse liegt und
daß der Einlaßkanal mit einer Schnauze (282) versehen ist, die sich in den Ansatz erstreckt, wobei die Schnauze den Eintritt von Flüssigkeit in die Einlaßkammer verhindert, wenn der Staubsauger horizontal ausgerichtet oder gekippt ist, so daß die Düse über dem Gebläse liegt,
 daß ein Filter (256) längs der Rückseite der Einlaßkammer angeordnet ist und durch den Luftstrom mitgeführte Festkörper aufnimmt,
 daß Entlüftungsöffnungen (258) längs des Motors angeordnet sind, durch die die von dem Gebläse getriebene Luft zusammen mit Schmutz und Flüssigkeit ausgeblasen werden, die durch die Ansaugung des Unterdrucks von dem Ansatz über das Filter in das Gehäuse gelangen könnten, wobei der Luftkanal im wesentlichen konisch ausgebildet ist und sein kleiner Durchmesser sich zu der Rückseite des

Gehäuses öffnet, wodurch Luft zu einem mittleren Bereich des Gehäuses geführt wird, während weiterer Raum für das Auffangen von Flüssigkeiten, die durch das Filter hindurchkommen könnte, vorgesehen sind und wobei das Gehäuse Entlüftungsöffnungen (258) umfaßt, die hinter und seitlich der Auslaßöffnung des Luftkanals angeordnet sind, um einen Auslaß für möglicherweise in den Kanal eingedrungene Flüssigkeit vorzusehen.

2. Staubsauger nach Anspruch 1, dadurch gekennzeichnet, daß das Gehäuse eine Querrippe (235) zum Abstützen des vorderen Endes des Motors aufweist, wobei ein Leitelement (274) sich von einem Ende der Rippe zu einer Stelle hinter den Entlüftungsöffnungen erstreckt, um Flüssigkeit von dem Motor weg durch die Entlüftungsöffnungen zu leiten.

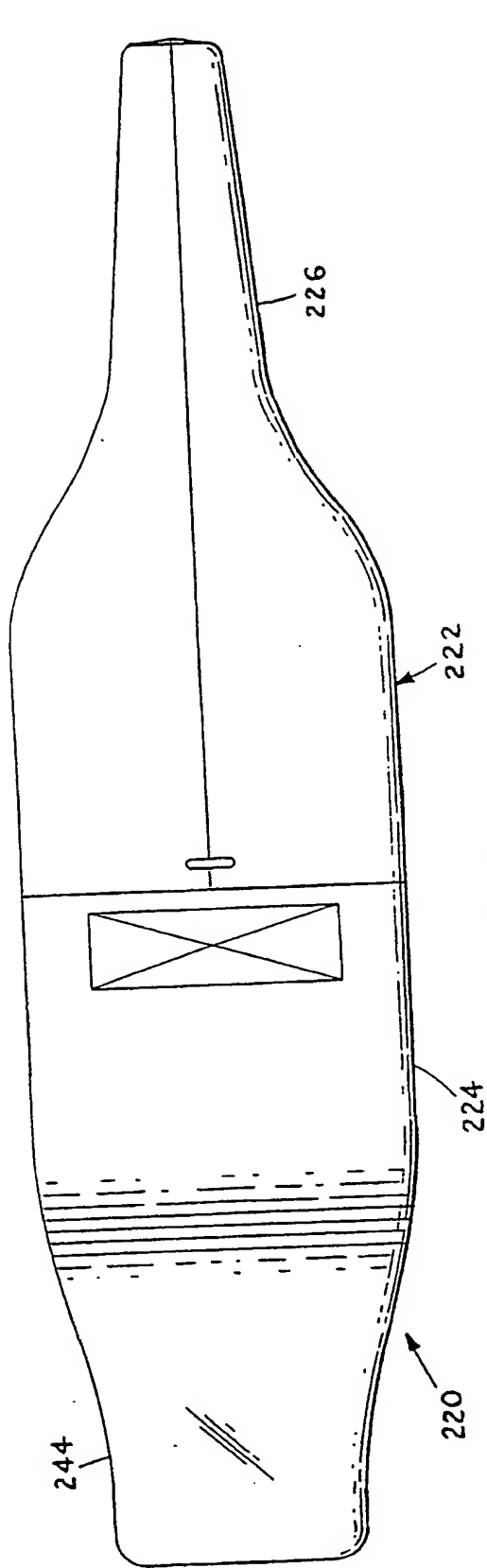


FIG. 1

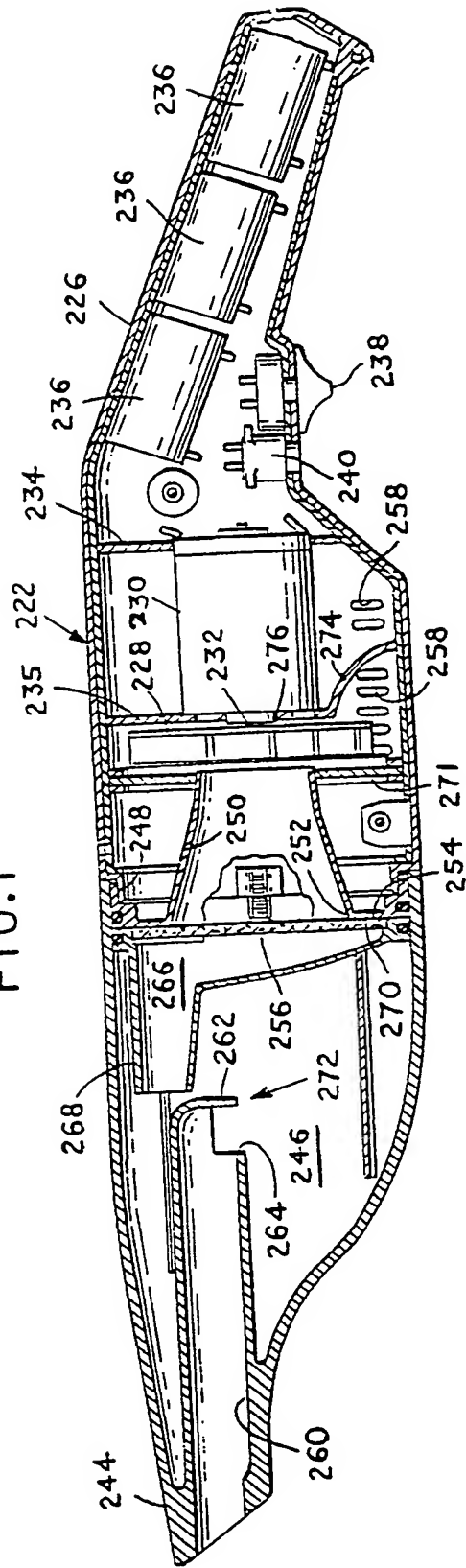
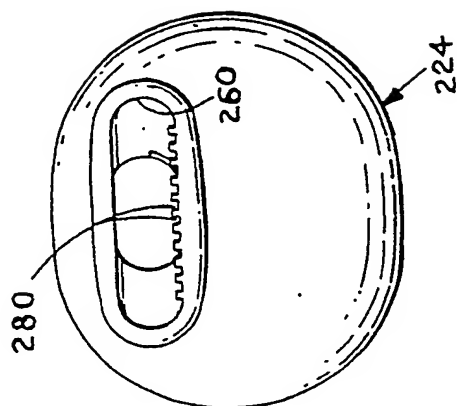
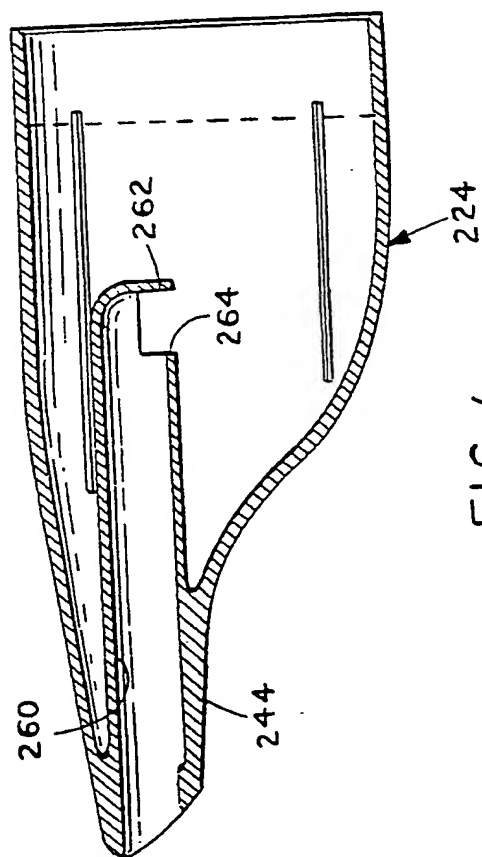
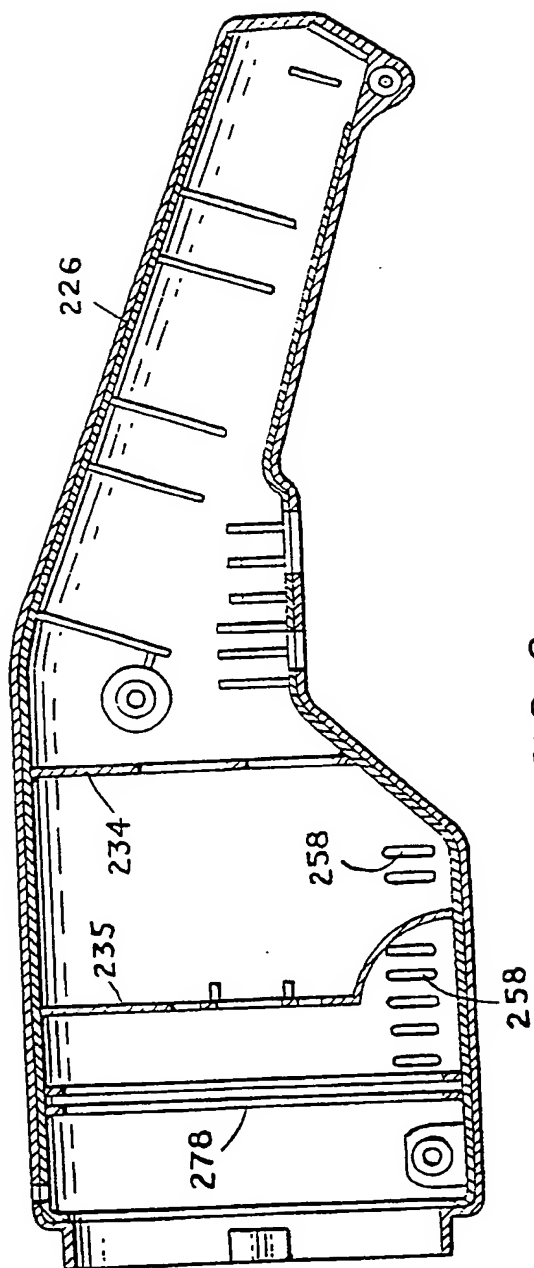


FIG. 2



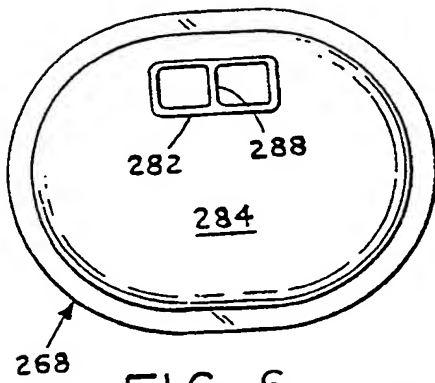


FIG. 6

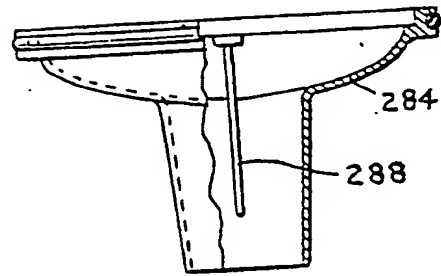


FIG. 7

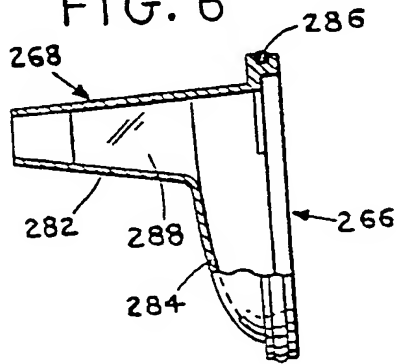


FIG. 8

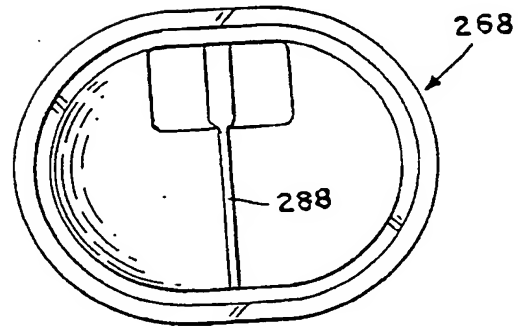


FIG. 9

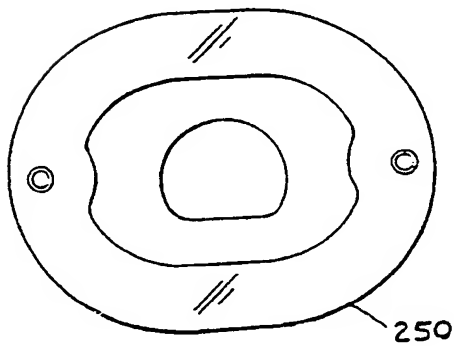


FIG. 10

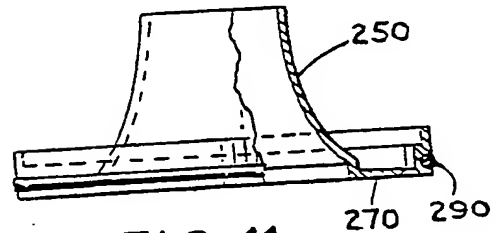


FIG. 11

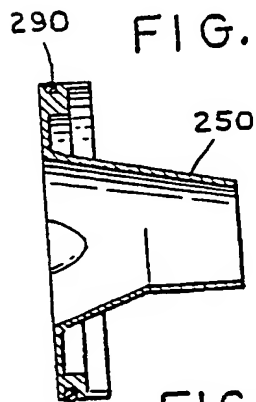


FIG. 12

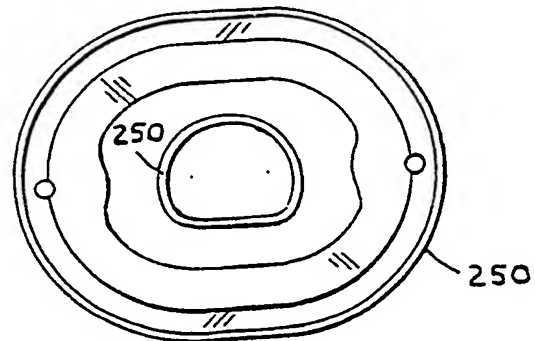


FIG. 13

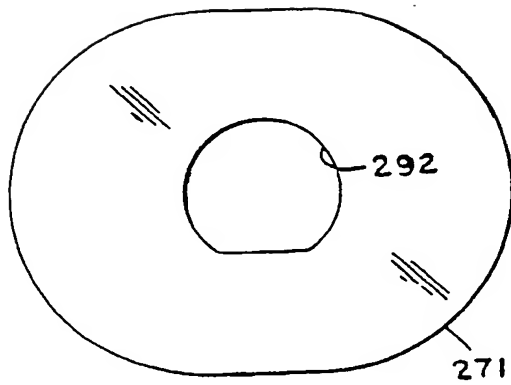


FIG. 14

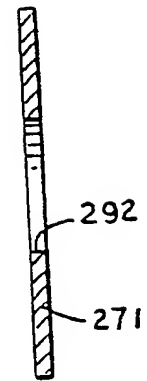


FIG. 15

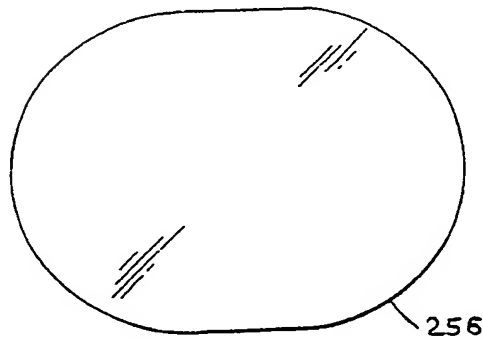


FIG. 16

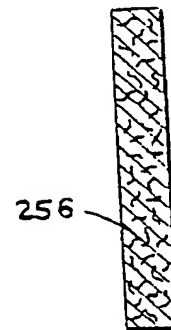


FIG. 17

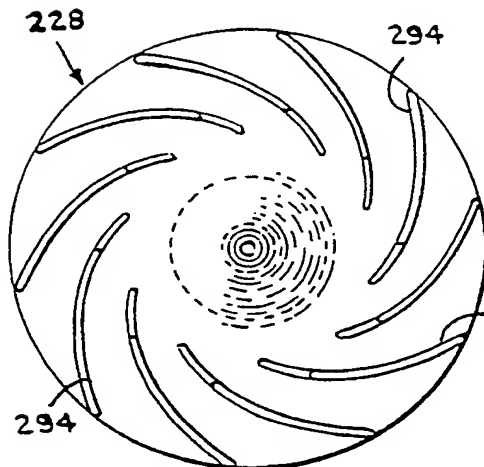


FIG. 18

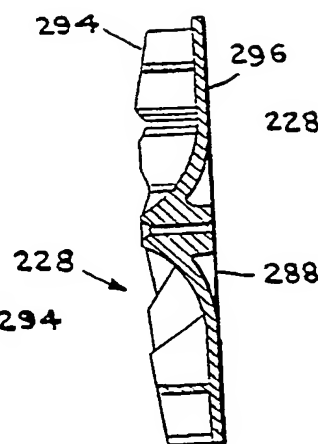


FIG. 19

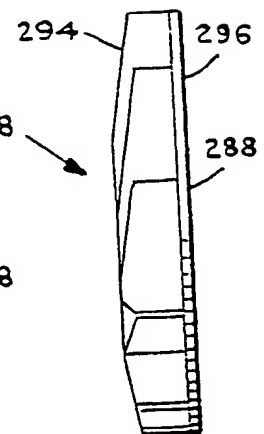


FIG. 20